

**REMARKS:**

Applicant has carefully studied the nonfinal Examiner's Action faxed February 11, 2003, and all references cited therein. The amendment appearing above and these explanatory remarks are believed to be fully responsive to the Action. Accordingly, this important patent application is now believed to be in condition for allowance.

Applicant responds to the outstanding Action by centered headings that correspond to the centered headings employed by the Office, to ensure full response on the merits to each finding of the Office.

**Claim Objections**

Claims 1-58 stand objected to due to informalities regarding the bracketed claim numbering in the application as filed. Applicant respectfully points out that the bracketed claim numbering is a result of the electronic filing software in use by the USPTO and is not the result of the Applicant.

**Claim Rejections – 35 U.S.C. § 112**

Applicant acknowledges the quotation of 35 U.S.C § 112, second paragraph.

Claims 12-16, 17-23, 41-45 and 46-52 stand rejected under 35 U.S.C § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. More specifically, independent claims 12, 17, 41 and 46 stand rejected for being narrative in form and not positively reciting steps of a specific process.

Independent claims 12 and 17 have been amended to place them in proper form as required. Claim 13-16 and 18-22 are dependent upon these amended base claims, which are now believed to be in proper form, as required under 35 U.S.C § 112, second paragraph. It is noted that independent claims 41 and 46 are system claims and as such are not directed to a process or method. As such, Applicant believes that independent claims 41 and 46 are in proper form as originally filed and have not been amended. Claim 42-44 and 47-51 are dependent upon these

base claims, which are also believed to be in proper form, as required under 35 U.S.C § 112, second paragraph.

**Claim Rejections – 35 U.S.C. § 103**

Applicant acknowledges the quotation of 35 U.S.C § 103(a).

Claim 1-4, 8, 12-13, 17-20, 30-33, 37, 41, 41, 46 and 47-49 stand rejected under 35 U.S.C § 103(a) as being unpatentable over Strait (U.S. Patent No. 6,438,186) in view of Fertner (U.S. Patent No. 6,185,251).

Regarding claims 1-4, the Office contends that Strait discloses at col. 3, line 36 to col. 4, line 26, an improved initialization method for a communication system comprising the step of, estimating a timing offset utilizing an entire received DMT frame. Applicant respectfully traverses the finding of the Office.

Amended claim 1 of the present invention claims an improved initialization method for a communication system comprising the steps of estimating a timing offset by correlating an entire received DMT frame with a pre-determined frame. Looking to the specification, paragraph [0017] discloses a timing offset that is comprised of an integer timing offset and a fractional timing offset. Paragraph [0044] of the specification states that the integer timing offset is referred to as the symbol timing offset and the fractional timing offset is referred to as the sample timing offset. As is well known in the art, for DMT transmission, two types of synchronization can be distinguished: sample synchronization and symbol synchronization. The sample synchronization unit identifies the sample timing offset and guarantees frequency alignment of the receiver sampling clock with the transmitter sampling clock. It measures the fractional delay  $\epsilon$  and corrects the sample timing accordingly. The symbol clock synchronizer unit detects the symbol timing offset  $\Delta$ , and determines from the received sample sequence the samples that belong to the same received symbol and controls which samples are fed to the FFT. As such, the timing offset estimation of claim 1 of the present invention includes both the symbol timing offset estimation and the sample timing offset estimation.

By contrast, at col. 4, lines 61-66, Strait describes a method intended to determine the sample offset to within one sample time so as to achieve overall symbol synchronization, and

that further timing correction to modify the precise sampling instant may be performed using other methods. Strait also states at col. 2, lines 50-54, that the present invention provides symbol timing initialization for a multi-carrier receiver. The method described uses phase measurements from a plurality of the individual carriers to make an initial determination of the symbol boundary. As such, Strait describes a method for estimating the symbol timing offset  $\Delta$  utilizing carrier phase measurements. Strait does not describe a method by which the sample timing offset  $\epsilon$  can be determined. In fact, Strait specifically states that the method described in U.S. Patent No. 6,438,186 does not teach a method to estimate the fractional portion of the timing offset and that other methods would be necessary. Therefore, the timing offset in claim 1 of the present invention is not equivalent to the symbol timing offset described by Strait.

Claim 1 has been amended to include the additional limitation that a correlation is performed utilizing an entire received DMT frame. Referring to amended claim 1, the timing offset estimate utilizes an entire received DMT frame through correlation with a pre-stored or pre-determined frame. As disclosed in the specification at paragraph [0044] the entire received DMT frame comprises N samples. The present invention performs a correlation with a pre-stored frame utilizing these N samples to estimate the timing offset. The correlation function used is shown in Fig. 3-1. The key concept of correlation is to compare the N samples of the DMT frame with the samples of a pre-stored frame and to select the delay where the correlation function has the maximum value.

By contrast, Strait describes at col. 3, lines 63-66, a technique to calculate the timing offset from an arbitrary location in the received DMT symbol by examining the phase of two carriers at frequencies  $f_1$  and  $f_2$ . As such, utilizing the phase characteristics of two carriers from the DMT frame as taught by Strait is not equivalent to utilizing the entire DMT frame of N samples to correlate with a pre-determined frame as disclosed and claimed by the present invention.

Additionally, by definition, correlation is a non-data aided method. Strait teaches a method that requires that data be transmitted and received for analysis of the two carrier frequencies of interest as described at col. 4, lines 10-13. As such, Strait teaches away from the

present invention by describing a data aided method and apparatus for symbol timing initialization

Regarding claim 8, the Office contends that Fertner discloses the step of estimating the channel impulse response utilizing a maximum mean-square error (MMSE) criterion through the pilot tones at col. 14, lines 19-49. The Office further contends that Fertner discloses a step of estimating a channel impulse response utilizing at least one pilot tone, wherein the received DMT frame further comprises the at least one pilot tone at col. 2, lines 24-57. Applicant respectfully traverses the finding of the Office.

Fertner describes a procedure for determining the time domain equalizer coefficients for an equalizer, where the equalizer compensates the received signals that are distorted by passing through the channel. As described by Fertner, a unit pulse is transmitted over the communications channel, and a channel impulse response is estimated from the received signal. A cost function establishes a mean-square error associated with the unequalized channel impulse response as compared to a desired impulse response signal. The unit pulse described by Fertner is not equivalent to the pilot tone disclosed by the present invention. Fertner describes the transmission of a unit pulse and the analysis of the received signal resulting from the transmitted unit pulse. As shown in Fig. 6 of Fertner, the unit pulse is transmitted and the amplitude of the pulse is sampled over time. With this method Fertner is able to provide the coefficients for a time-domain equalizer (TEQ) to shorten the effective length of the channel impulse response which effects all the DMT tones equally, without regard to the transmission frequency.

By contrast, the present invention discloses at paragraph [0047] the transmission of known QAM symbols over certain pilot tones. These QAM symbols are transmitted within the DMT frame used for the timing offset estimation as claimed. The transmission and receipt of the pilot tones provides an estimate of the channel on a per tone basis allowing the implementation of a frequency-domain equalizer (FEQ) for each tone enabling optimization of the signal-to-noise ratio and hence the bit rate. As state is paragraph [0051] of the present invention, the implementation of FEQ can efficiently compensate for channel attenuation and phase rotation.

As such, the unit pulse taught by Fertner is not equivalent to the pilot tones transmitted within the DMT frames used for the timing offset estimation as claimed by the present invention.

Fertner teaches away from the present invention by suggesting the use of a unit pulse to determine time domain equalizer coefficients for an equalizer.

In summary of amended claim 1:

<b>Present Invention Claim 1 Element</b>	<b>Reference Cited</b>	<b>Claim Element Present in Reference Cited?</b>
estimating a timing offset	Strait U.S. Patent No. 6,438,186	No. Strait describes the estimation of only one component of the timing offset, namely the symbol timing or integer estimation
by correlating an entire received DMT frame	Strait U.S. Patent No. 6,438,186	No. Strait describes utilizing phase difference between two carriers
estimating a channel impulse response	Fertner U.S. Patent No. 6,185,251	Yes.
utilizing at least one pilot tone	Fertner U.S. Patent No. 6,185,251	No. Fertner describes utilizing a unit pulse
wherein the received DMT frame further comprises the at least one pilot tone	Fertner U.S. Patent No. 6,185,251	No. Fertner does not describe the use of a pilot tone within a received DMT frame

For the reasons cited above, Applicant believes that amended independent claim 1 is patentable over Strait (U.S. Patent No. 6,438,186) in view of Fertner (6,185,251) and is believed to be in condition for allowance.

Claims 2-4 and 8 dependent upon claim 1, and are therefore allowable as a matter of law.

Claim 12 is similar to claim 1. For the reasons cited above with regard to claim 1, amended claim 12 is believed to be in condition for allowance. Claim 13 is dependent upon claim 12 and is therefore allowable as a matter of law.

Claim 17 is similar to claim 1. For the reasons cited above with regard to claim 1, amended claim 17 is believed to be in condition for allowance. Claims 18-20 are dependent upon claim 17 and are therefore allowable as a matter of law.

Claim 30 is similar to claim 1. For the reasons cited above with regard to claim 1, claim 30 is believed to be in condition for allowance. Claims 31-33 and 37 are dependent upon claim 30 and are therefore allowable as a matter of law.

Claim 41 is similar to claim 1. For the reasons cited above with regard to claim 1, amended claim 41 is believed to be in condition for allowance. Claim 42 is dependent upon claim 41 and is therefore allowable as a matter of law.

Claim 46 is similar to claim 1. For the reasons cited above with regard to claim 1, claim 46 is believed to be in condition for allowance. Claims 47-49 are dependent upon claim 46 and are therefore allowable as a matter of law.

If the Office is not fully persuaded as to the merits of Applicant's position, or if an Examiner's Amendment would place the pending claims in condition for allowance, a telephone call to the undersigned at (727) 507-8558 is requested.

Very respectfully,

SMITH & HOPEN

By:   
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Dated: February 21, 2003

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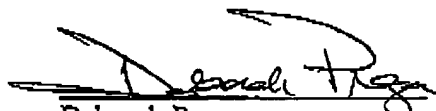
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CERTIFICATE OF FACSIMILE TRANSMISSION

(37 C.F.R. 1.8(a))

I HEREBY CERTIFY that this Amendment B is being transmitted by facsimile to the United States Patent and Trademark Office, Art Unit 2631, Attn.: Khai Tran, (703) 872-9314 on February 21, 2003.

Dated: February 21, 2003

  
Deborah Preza